THE

BELFAST MONTHLY MAGAZINE.

No. 11.] JUNE 30, 1809. [Vol. 2.

COMMUNICATIONS, ORIGINAL AND SELECTED.

For the Belfast Monthly Magazine.

EXPERIMENTS ON THE HYDROMETER.

MECHANICAL men are not generally in the habit of writing or communicating to the public the discoveries which arise from their experience, even though such information could be of no injury to themselves. Nevertheless, circumstances apparently small and trifling not unfrequently occur to observing artists, which, when made known might be of the greater use both to the philosopher and the man of business.

This is the only apology I shall make for laying before the public through the medium of your Magazine the following experimental observations concerning the Hydrometer, relative to its accuracy in showing the specific gravity of fluids; its use in showing the temperature in the same manner as the Thermometer; how it may be made to act as a Baroscope, and how it is convertible into a Barometer.

Whether these observations be useful or not, I do not pretend to say, but shall briefly mention them as they occurred, first premising, that in Hydrometers for finding the specific gravity of fluids or solids (where accuracy is required) the body or ball B, (fig. 1) must be large and the stem S, small, also it must be weighted or balanced at b, so as to cause the stem S, to stand upright when put in a fluid contained in a convenient shaped vessel. These are things generally known.

In the course of business I made an Hydrometer, of which the ball B, was two inches diameter, and the stem S, .02 of an inch diameter, and 12 inches long. By this instrument I found the specific gravity of water sensibly changed when only *one ounce* of alkaline salt was mixed with 400 *gallons* of water, $\frac{1}{7755}$ in comparative weights to each other.

I next examined what effect different temperatures had upon this instrument. At the time I was trying the experiment, the water I used showed 50° of heat according to Farenheit's scale, and the Hydrometer stood in the water at 50° (fig. 1) I gradually increased the heat of the water to 75° of the same scale, during which time the Hydrometer sunk 12 inches, as marked 75° in the same figure.* This experiment proves that the instrument is capable of showing the *different temperatures*, in the same manner as the Thermometer, also teaches us what care is necessary in finding and observing the temperature of a fluid before its specific gravity can be correctly known.

When I reflected on the discovery I had now made, that this instrument rendered the degrees of heat and cold very conspicuous by the specific gravity of the water being varied according to the temperature,‡ the following idea occurred to my mind; if a large ball or glass bubble, hermetically sealed, were placed on the top of the stem S at a, and adjusted by balance, so that the surface of the water might intersect the stem S, at C; after such adjustment, should the air become specifically heavier, the bubble would be moved upwards, and find its balance by moving more of the stem S, out of the water into the air; if the air became lighter the reverse would be the effect.

* The Hydrometer here referred to was made of Glass. Brass Hydrometers expand more and do not show the variations by heat and cold so sensibly.

‡ It moved nearly half an inch for each degree of heat the water received.

In trying the experiment the result exactly agreed with the idea beforementioned, so that during the time the temperature remained the same, the instrument possessed all the properties of the Baroscope; but in different temperatures and fluids it contains the united properties of the *Hydrometer*, *Thermometer*, and *Barometer*.

FIG. 2.

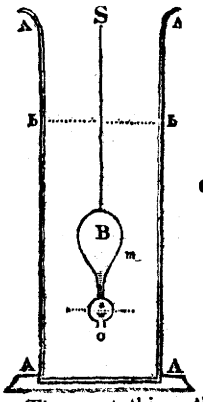
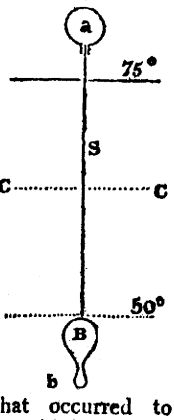


FIG. 1.



The next thing that occurred to me was to discover how this instrument could be employed as a Barometer only. This I effected by a small alteration, as follows.

AAAA (fig. 2) is a large glass vessel filled with water to b b: B, the ball, S, the stem as in the former experiments, only that the instrument is now weighted or balanced by the mercury m, in the ball B, which is hermetically sealed. Under the large ball B, another small ball a w, is fastened, having an opening, o, in its lower extremity. This float S, B, o, being adjusted by weights &c. to stand in the water so that the surface of the fluid may intersect the middle of the stem S, when the Barometer stands at changeable. The small ball a w, is partly filled with air, and partly with water, as shown by the dotted line. In this state of adjustment, should the air become heavier the pressure will be more upon the surface of the water at b b, which will occasion more water to pass through the hole o, into the small ball a w, the float will become heavier and consequently sink until it comes to a balance, by causing more of the stem S, to be immerged in the water. The contrary will be the effect when the air becomes lighter.

It only remains to find by experiment whether the different proportions of the instrument be correct; this can be done in the following manner. Remove the whole instrument, as above described, into a warm place; should the float sink when heated, the remedy is to adjust it with more air in the small ball a w, but should it rise by being heated, it must be adjusted with more water in the small ball: if it neither rise nor sink when heated, then and then only it is right, as in such case the absorption and contraction of the air in the small ball by cooling counterbalances the water as it becomes specifically heavier and *vice versa*.

But should the stem be too small it cannot stand at any determined height, or in other words, will not be a balance to the air at any height of the stem, because more water will go into the small ball a w, by its being depressed by the water's increasing depth or pressure, than space taken up by the stem S, in going through the same space, and should it be too large, the space it will move through, from the variations of the atmosphere will be but small; but when all its parts are duly proportioned and adjusted, it shows the *minute Barometrical changes* of the atmosphere more visibly than any instrument I have yet seen.

JOB RIDER.

Belfast May 15, 1809.

For the Belfast Monthly Magazine.

FOR AND AGAINST THE USE OF TOBACCO.

A YOUNG man was extremely fond of smoking, but being persuaded by some of his female acquaintance, he consented to drop it for three months: a few weeks after he laid it aside, he wrote the following lamentation—The answer is from the pen of his female acquaintance.

THE FAREWELL.

Hail divine tobacco! In thee how